The Survey Procedure

All survey work follows a simple four-step procedure:

1. Planning
2. Collecting Measurements
3. Processing Measurements
4. Drawing Up

Each step is discussed in detail below:

Planning

The actual amount of time the team will spend on site and underwater is usually very short. It is essential that any work is well planned before it is started so work on site is efficient, safe and problem-free.

The level of detail and accuracy required more or less define the techniques that can be used, these should be specified in the research design. The equipment available and the experience of the team also limit the techniques that can be used but the overriding factor may be the site type.

Collecting Measurements

By the time you come to start recording the site the plan should have been explained to all involved. This is the point where teamwork and communication become very important. If the team are well briefed before work and de-briefed afterwards then the team leader can deal with problems as they are found.

Any recording forms that have measurements on them should be well looked after. The forms are the primary record of your work and should be kept even after they have been processed. Keeping a notebook with day to day accounts, speculations and ideas about the site is often useful, the notes can be handy later on when the measurements are being processed.

To be efficient the team needs to be well trained and well practised. If any team member needs a refresher then the survey techniques to be used can be practised on dry land beforehand.

Processing Measurements

In the processing stage the measurements that have been collected are used to calculate the positions of the points or detail we are trying to record. Often this process is done while drawing up the site plan if the points are to be plotted by hand.

For some methods distance measurements are corrected for differences in depth. Depth measurements should be corrected for changes in the height of tide during recording. At this stage any mistakes need to be identified and repeat measurements requested.

Drawing Up

With sketches or measurements collected from your site you can start to create the site plan. The plan may be drawn by hand or drawn on a computer. Computer generated plans are more useful as printed copies can easily be made, they can be printed at different scales and the level of detail shown can vary as the work progresses.

If the site has not been recorded before then the sketches or assessment survey results can be turned into a site plan. In doing this you are likely to find that something has been missed and additional work is required.

If a recording survey is being done then the first step is to position the control points around the site on the site plan. Measurements may be needed from the control points to a couple of the main features on the site to align previous site plan with the control points. With the control in place the features can then be added to the plan as they are recorded and processed.

Plane

A plane is a flat surface with no thickness.

Our world has three dimensions, but there are **only two dimensions on a plane**.

Examples:

- **length** and **height**, or
- **x** and **y**

And it goes on forever.

What is plane surveying?

There are two classes of surveying land, plane and geodetic. In geodetic surveying, the curved surface of the earth is taken into consideration and therefore the measurements are done in three dimensions. In plane surveying, the land is considered to be flat and the measurements are done in two dimensions. Plane surveying is less accurate but when surveying small areas, the area is nearly flat.

Read more:
http://wiki.answers.com/Q/What_is_plane_surveying#ixzz16kG4qIiZ

What is map?

A **map** is a visual representation of an area-a symbolic depiction highlighting relationships between elements of that space such as objects, regions and themes.

If you are refering to a "map" sensor on a car it stands for manifold absolute pressure.

Read more: http://wiki.answers.com/Q/What_is_map#ixzz16kHJz7ab

traversing

Traversing is the process of measuring the length and direction (bearing) of the sides of a traverse.

A traverse is a series of successive straight lines that are connected. They can be closed or open. A closed traverse can be easily checked for accuracy because they either A. begin and end at the same point or B. Begin and end at known points, provided both the starting and finishing point use the same coordinate system. The boundary lines of a piece of property are a good example of a closed traverse. An open traverse can not be checked for accuracy and are normally used for exploratory purposes

Read more:
http://wiki.answers.com/Q/What_is_traversing_in_engineering_survey#ixzz18IlfGr7p

Techniques

The techniques used for surveying and land measurement are dependent upon the type of survey being conducted. In this section there are two choices:

Types of survey

Techniques

Types of Survey

A simple classification is:

1. **Land surveys, which fix property lines, calculate land areas and assist with the transfer of real property from one owner to another.**

2. **Engineering surveys, which collect the data needed to plan and design engineering projects. The information ensures the necessary position and dimension control on the site so that the structure is built in the proper place and as designed.**

3. **Informational surveys obtain data concerning topography, drainage and man-made features of a large area. This data is portrayed as maps and charts.**

Another way to make a simple classification is:

1. **Geodetic surveys are precise and over large areas require the curvature of the earth to be considered. Distances and angle measurements must be very, very accurate. A wide variety of techniques are used including triangulation, traversing, trilateration, levelling and astronomical direction fixing.**

2. **Plane surveys, which consider the surface of the earth to be a plane. Curvature is ignored and calculations are performed using the formulas of plane trigonometry and the properties of plane geometry. These may be considered accurate for limited areas.**

Sub-categories of the major classes provide more insight into the various fields of surveying as follows:

- **Property surveys determine boundary lines, property corners, rights-of-way provide data necessary for the preparation of land sub-divisions.**

- **Cadastral surveys are executed by the Federal Government in connection with the disposal of vast areas of land known as the public domain.**

- **Route surveys are necessary for the design and construction of various engineering projects such as roads, railways, pipelines, canals and powerlines.**

- **Industrial surveys, or optical metrology, are used in the aircraft and other industries where very accurate dimensional layouts are required.**

- **Topographic surveys are performed to gather data necessary to prepare topographic maps. These are multicolour contour maps portraying the terrain; and rivers; highways, railways, bridges and other man-made features.**

- **Hydrographic surveys map the shorelines of bodies of water; chart the bottom of streams, lakes, harbours and coastal waters; measure the flow of rivers; and assess other factors affecting navigation and water resources. The sounding of depths by radar is involved in this type of survey.**

- **Mine surveys determine the position of underground works such as tunnels and shafts, the position of surface structures and the surface boundaries.**

- **Aerial surveys use photogrammetry to produce a mosaic of matched vertical photographs, oblique views of landscape and topographic maps drawn from the photographs.**

- **Construction surveys fix elevations, horizontal positions and dimensions for construction projects.**

- **Control surveys provide basic horizontal and vertical position data. These are called datum. For most surveying work the vertical position of points in terms of height above a curved reference surface is mean sea level.**

Techniques

1. Triangulation

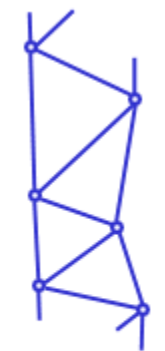
2. Trilateration

3. Traverse

4. Leveling

5. [Radiation](#)

Triangulation

Triangulation consists of a series of connected triangles which adjoin or overlap each other, angles being measured from determined fixed stations. Triangulation reduces the number of measures that need to be taped and for this reason is often a preferred method of survey. A known base-line measurement is required. Three examples of triangulation systems are shown below.

A single chain of triangles is a rapid and economical system for covering a narrow strip of land. A chain of quadrilaterals is more accurate with checks being made by various combinations of angles and sides as the survey proceeds. Larger areas use a central point arrangement. A point to note is that all angles should be more than 20°. Angles less than 20° are not considered valid for fixing position. They introduce inaccuracies. This is much the same in navigation where a fix by two bearings requires an angle of intersection of approximately 90°, and for three bearings approximately 60°. Angles less than 30° are not acceptable.

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Trilateration

Trilateration uses electronic distance measuring equipment to directly measure the lengths of the sides of triangles from which the angles can be calculated. It is a very useful method

for rough terrain where positions can be accurately carried forward and is seen as an alternative method to triangulation.

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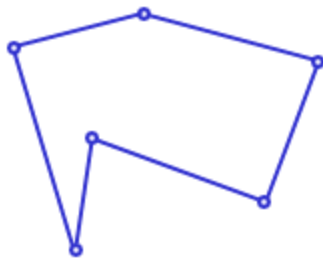
Traverse

A traverse consists of a series of lines, whose lengths and directions are measured, connecting points whose positions are to be determined. The route of the traverse line can be adjusted for obstacles such as rough or timbered terrain, swampy land, buildings and areas of heavy traffic. A traverse may be either open or closed as shown below.

An open traverse begins at a point of known position and ends at a station whose relative position is unknown. This type of traverse is frequently used for preliminary surveys for highways. A closed traverse begins and ends at the same point whose position is known. An example of this type of traverse is a perimeter survey of a tract of land.

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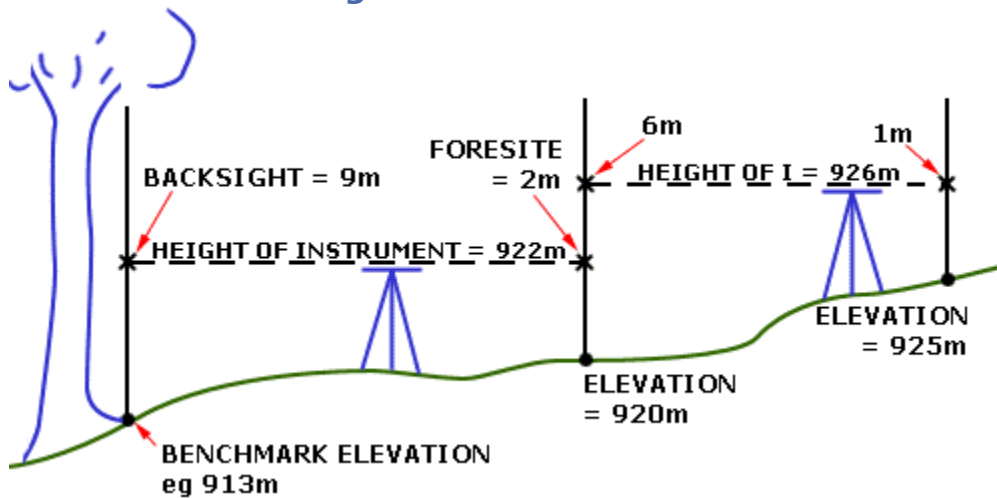
Leveling

Leveling is the operation of determining differences of elevation by measuring vertical distances directly on a graduated rod with the use of a leveling instrument such as a dumpy level, transit or Theodolites. This method is called direct leveling or differential leveling. Indirect leveling can be done using the principle that differences in elevation are proportional to the differences in atmospheric pressure. The difference in elevation between two points can also be determined trigonometrically using vertical angles and horizontal or inclined distances.

Differential leveling

Benchmarks are very important in leveling. They are permanent objects of known elevation located where there is least likelihood of disturbance. They may be a metal or concrete post set close to the ground, a notch in a tree root or a peg or spike in a tree.

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Radiation

Radiation is a surveying technique often used in conjunction with a plane table. From a fixed position directly above the corresponding location on the ground bearings are taken to various points at the boundary of the survey area. The bearing lines are drawn on the paper on the table. Distances to the points are measured and then converted to the required scale on the survey sheet. Radiation surveying can be performed in a similar way directly on the ground taking bearings and distances from a fixed position and recording them for later work. Similarly plane table surveying may be used with other techniques such as a traverse or triangulation.

TOPOGRAPHIC SURVEYS The purpose of a TOPOGRAPHIC SURVEY is to gather survey data about the natural and man-made features of the land, as well as its elevations. From this information a three- dimensional map may be prepared. You may prepare the topographic map in the office after collecting the field data or prepare it right away in the field by plane table.

Topography refers to the characteristics of the land surface. These characteristics include **relief, natural features,** and **artificial** (or **man-made)** features. Relief is the conjuration of the earth's surface and includes such features as hills, valleys, plains, summits, depressions, and other natural features, such as trees, streams, and lakes. Man-made features are highways, bridges, dams, wharfs, buildings, and so forth. A graphic representation of the topography of an area is called a **topographic map.** A topographic map is simply a drawing that shows the natural and artificial features of an area. A **topographic survey** is a survey conducted to obtain the data needed for the preparation of a topographic map. This data consists of the horizontal and vertical locations of the features to be shown on the map.

Cadastral surveys

Cadastral surveys document the boundaries of land ownership, by the production of documents, diagrams, sketches, plans (plats in USA), charts, and maps

Cadastral map

A *cadastral map* is a map that shows the boundaries and ownership of land parcels

engineering surveying
Provides control for the design and development of man-made structures. It is the foundation of all construction and development projects